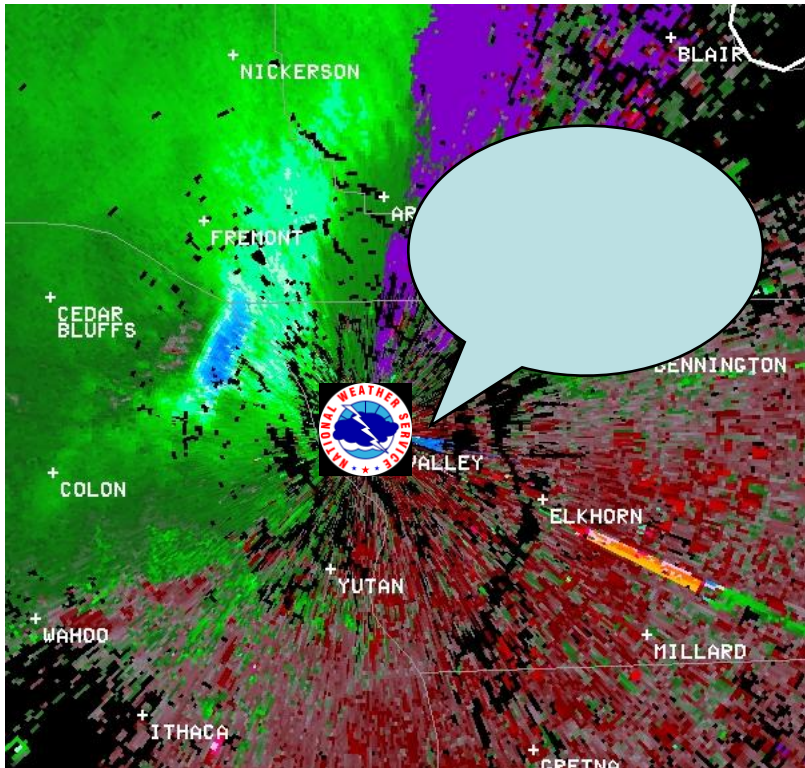


# The 27 June 2008 Damaging Wind Event across Omaha, NE

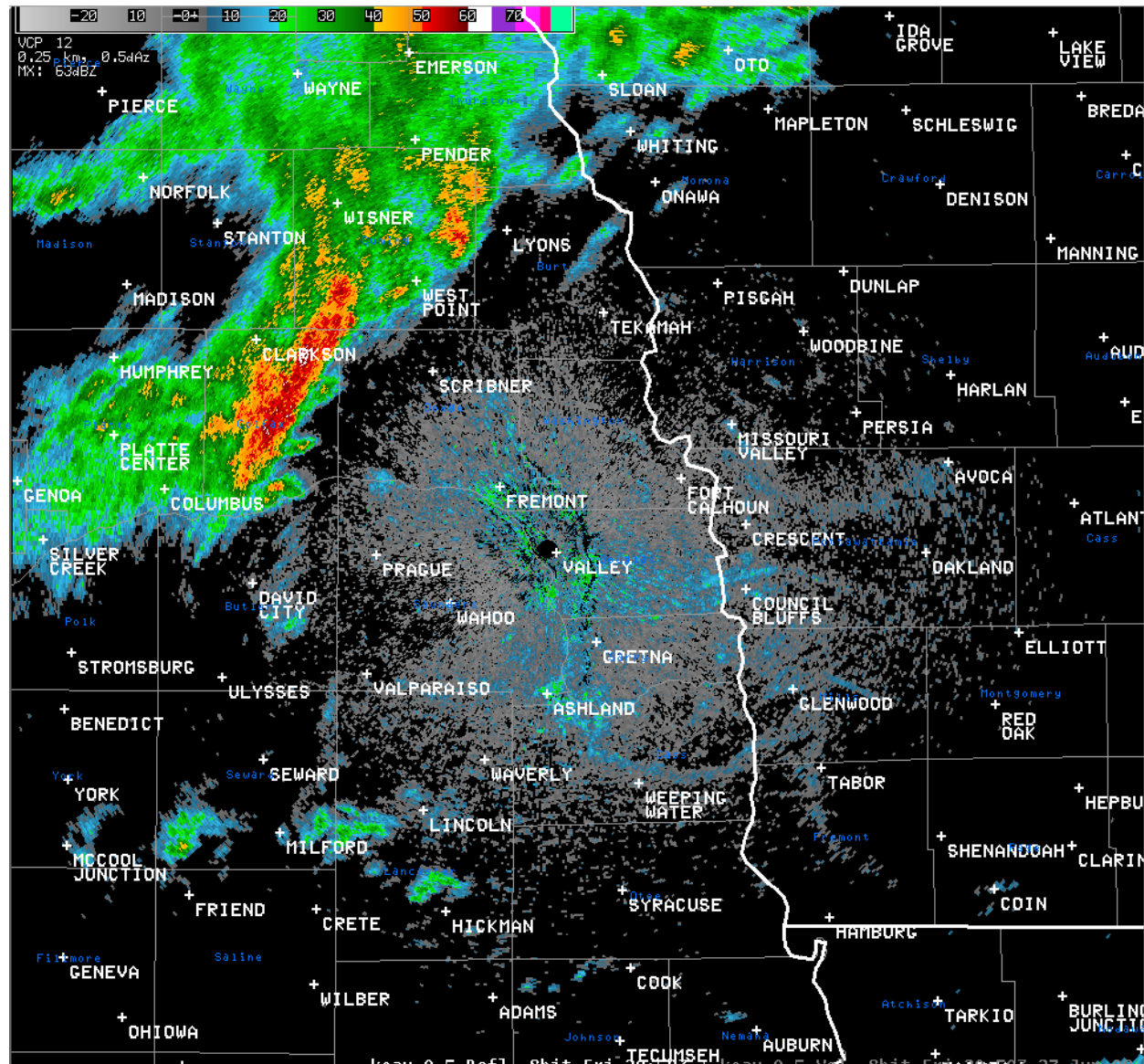


**Barbara Mayes and Brian Smith**  
**National Weather Service**  
**Omaha/Valley, NE**

12<sup>th</sup> Annual High Plains Conference  
Hayes, KS  
September 5, 2008

# Presentation Outline

- Event Overview
- Synoptic Overview
- Mesoscale Features
- Radar Presentation
- Event Impacts
- Summary



KOAX Radar Loop to 2350 UTC



# Event Impacts

## Storm statistics:

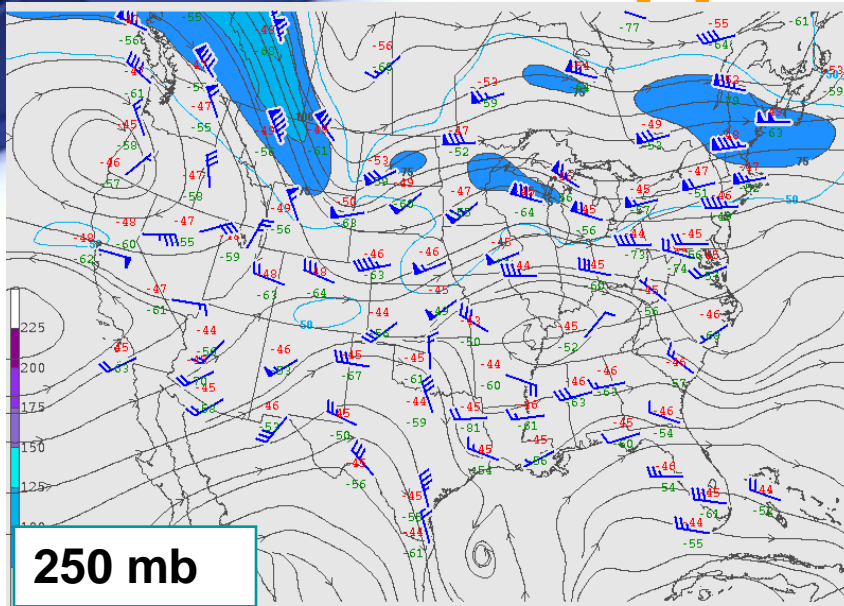
- Path length: 90 miles
- Path width: 4 to 6 miles
- Estimated maximum wind speeds: 110-115 mph (EF2)
- One fatality (tree fell on car in Council Bluffs, IA) and several minor injuries
- Damage estimate: \$53+ million in Douglas County (Omaha) alone

## One of a series of storms to affect the Omaha metro area:

- 5/24: Wind damage (power outages)
- 6/4: Wind and hail
- 6/8: Nocturnal QLCS tornado \*
- 6/10: Hail
- 6/11: Little Sioux Boy Scout Camp tornado (several victims from Omaha area); brief tornado NW of Omaha
- 6/15: Wind damage and hail

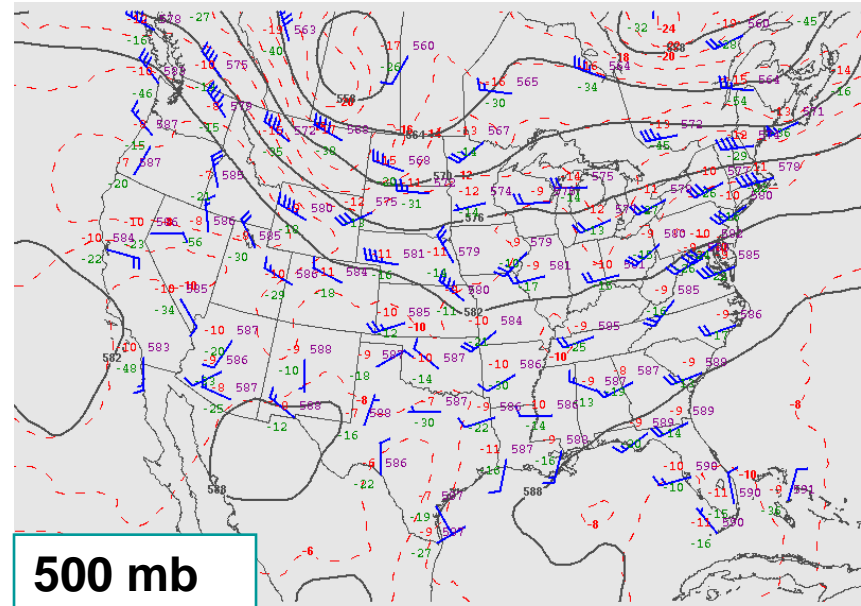
\* Resulted in heightened awareness of siren policy, with sirens sounded on 6/27

# 1200 UTC Upper Air Observations



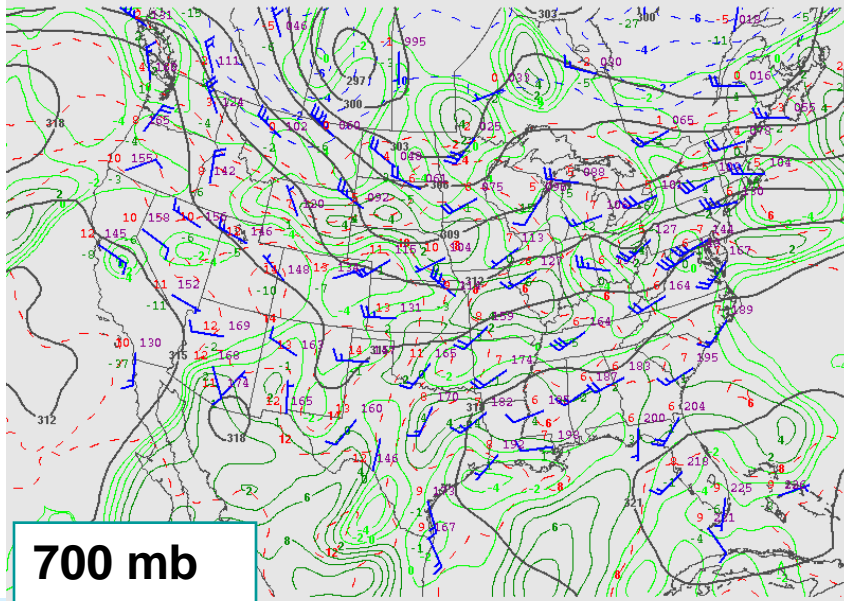
**250 mb**

080627/1200 250 MB UA OBS AND ISOTACHS



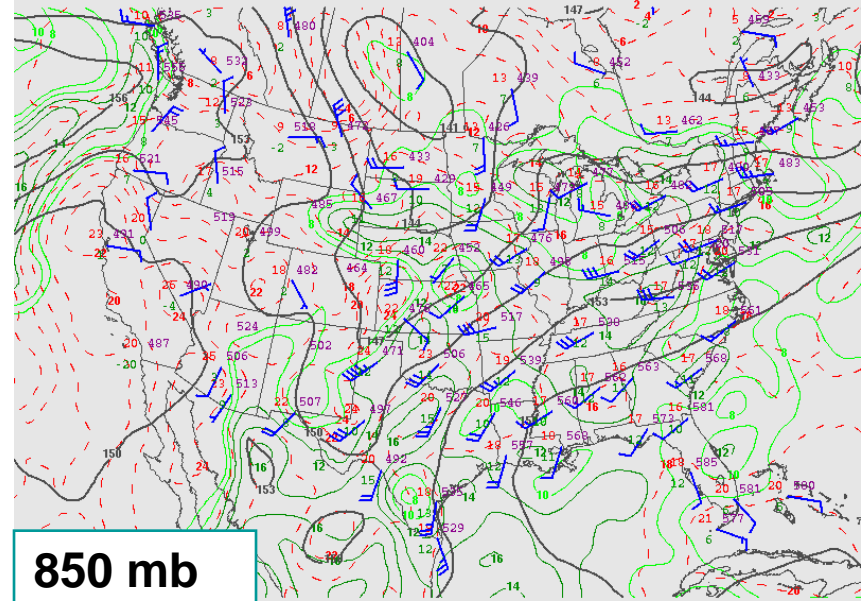
**500 mb**

080627/1200 500 MB UA OBS, HGHTS, and TEMPS



**700 mb**

080627/1200 700 MB UA OBS, HGHTS, TEMPS, Td--4

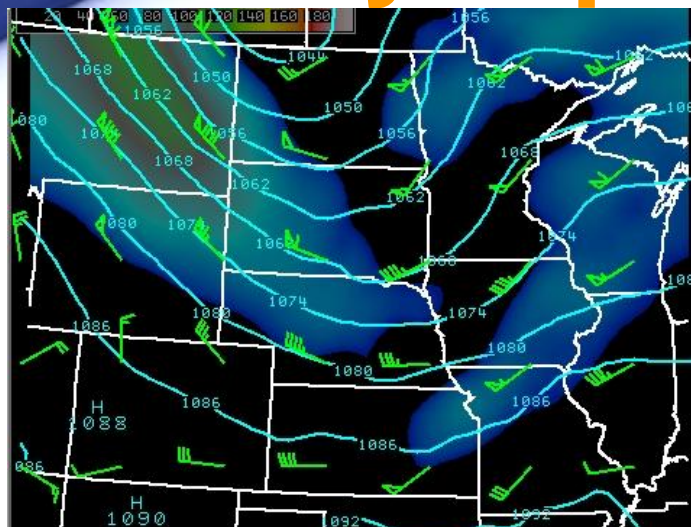


**850 mb**

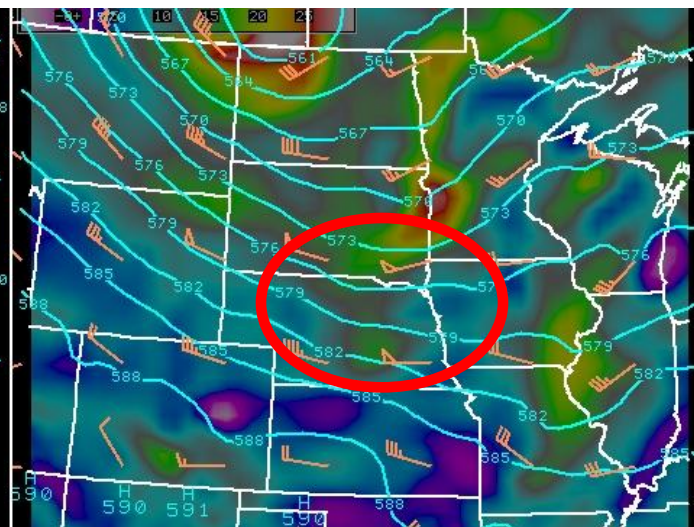
080627/1200 850 MB UA OBS, HGHTS, TEMPS, Td--8

# Synoptic Overview

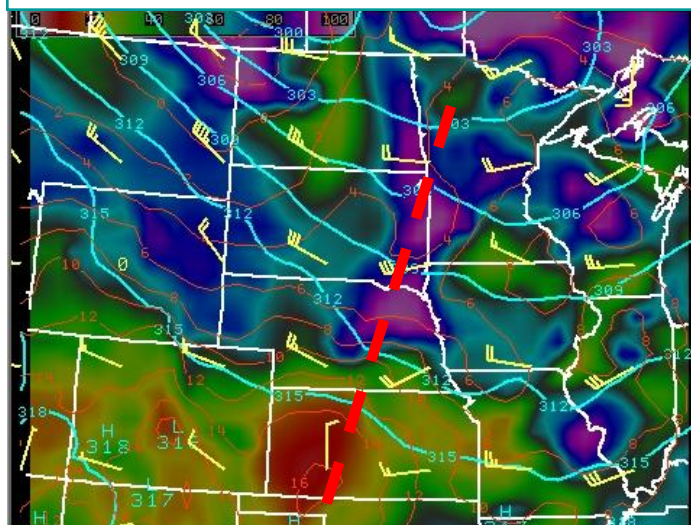
- RUC40 2000 UTC 27 June
- Note:
  - 500 mb jet
  - 700mb and 850 mb trough axes



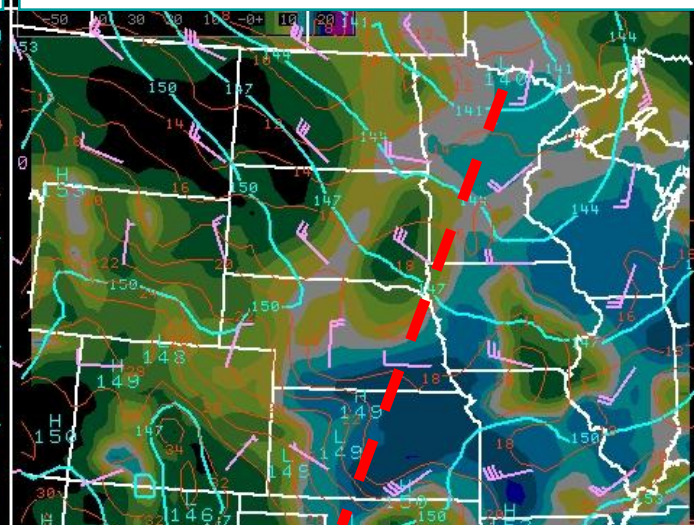
**250 mb ht, wind, wind speed (shaded)**



**500 mb ht, wind, vorticity (shaded)**



**700 mb ht, wind, temperature, RH (shaded)**



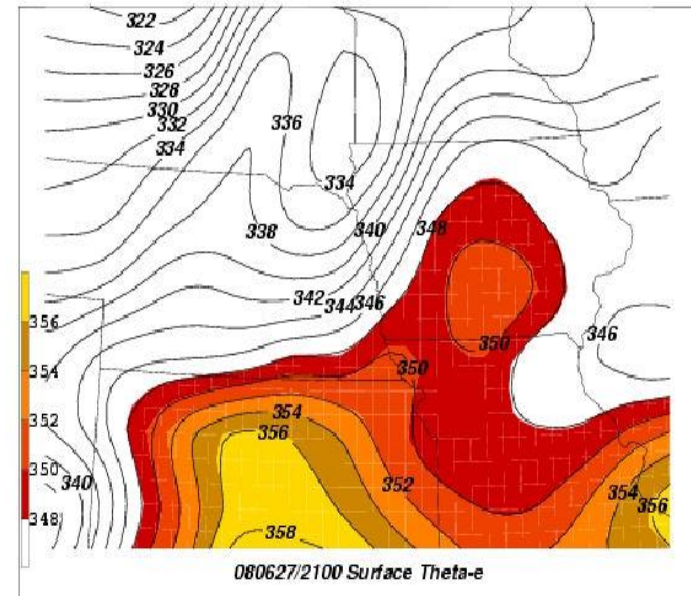
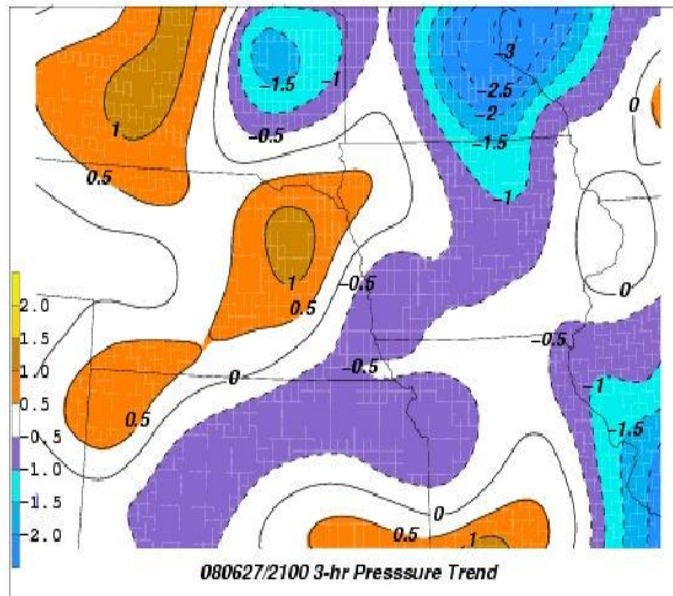
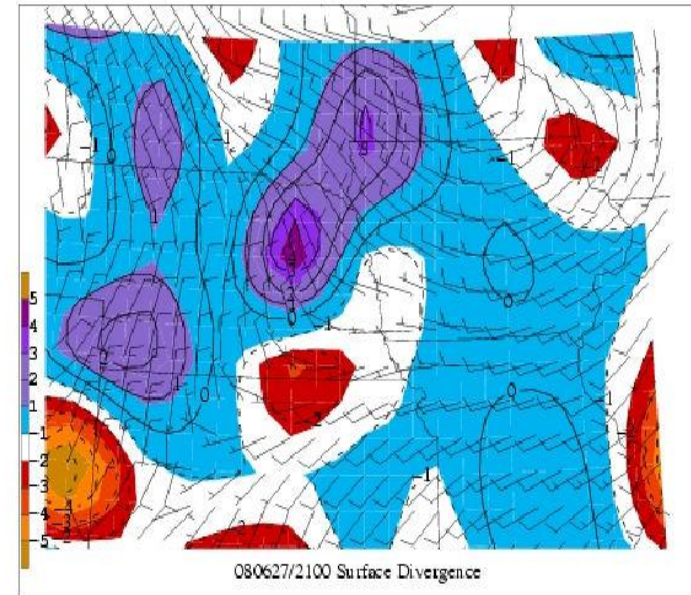
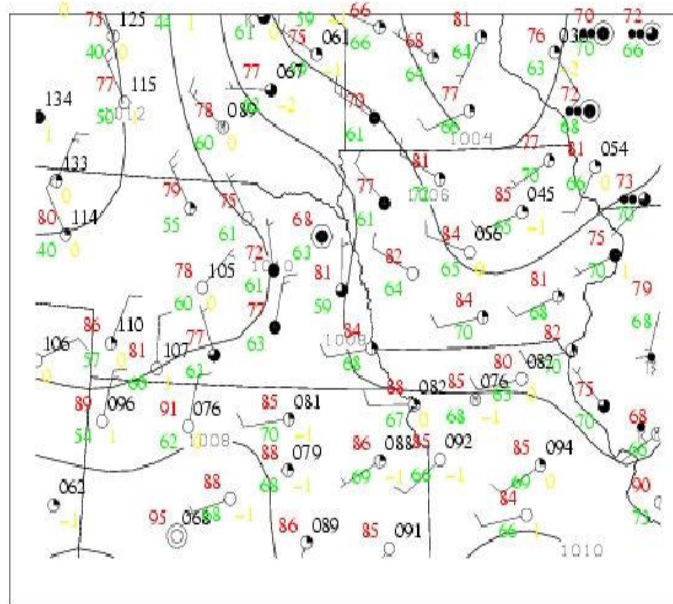
**850 mb ht, wind, temperature, dewpoint (shaded)**

# Surface Analysis

- 2100 UTC 27 June

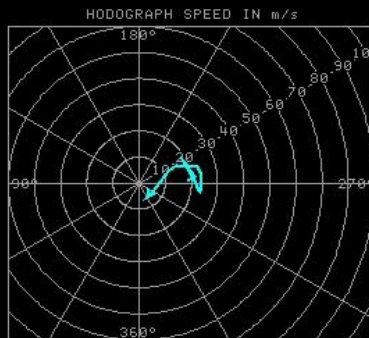
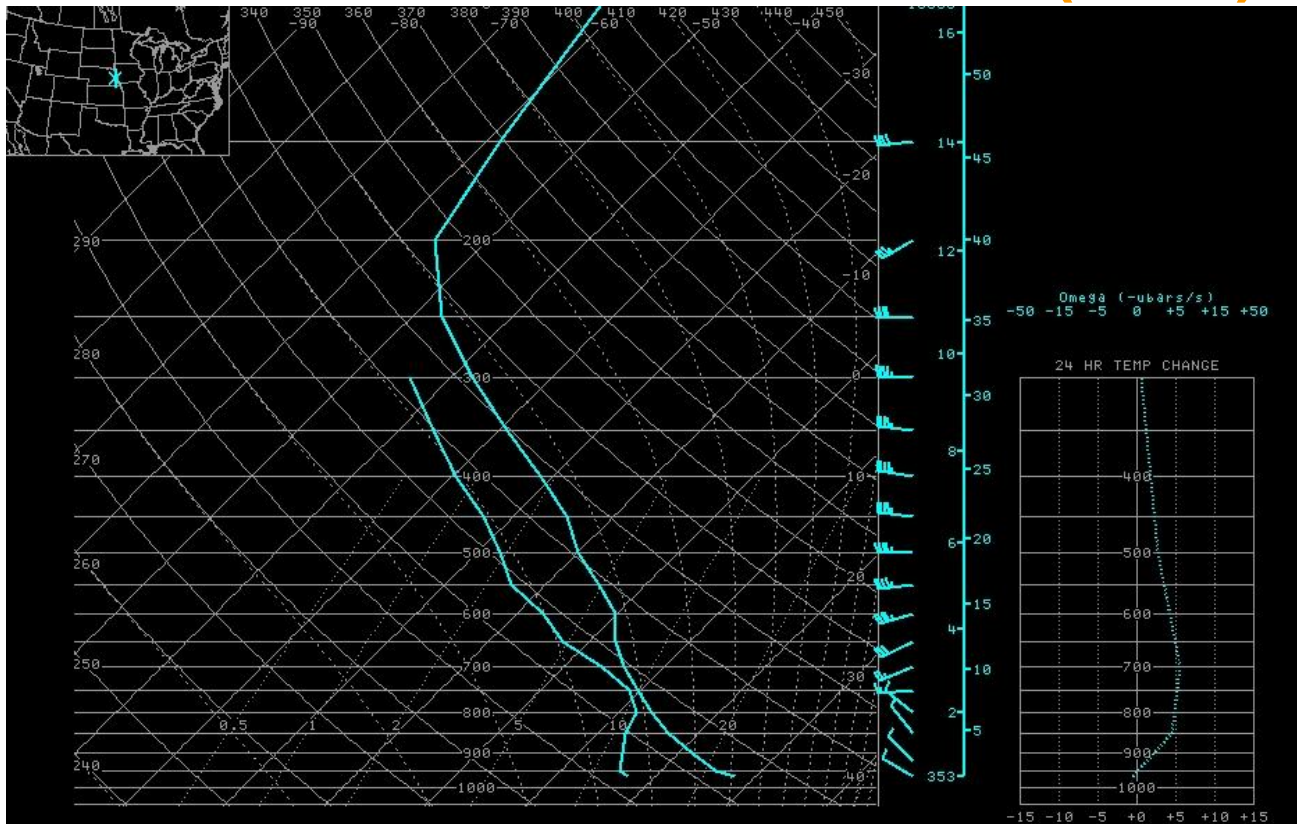
- Note:

- Several weak boundaries
- Strong pressure rise and divergence behind storms
- High theta-e ahead of storms



# Point Sounding at KOAX: 2100 UTC 27 June (RUC)

- 1566 J/kg CAPE
- -2 J/kg CIN
- Dry below LCL
- Dry 700-500 mb
- 14175 ft freezing level
- Strong, unidirectional bulk shear (esp. above LCL)



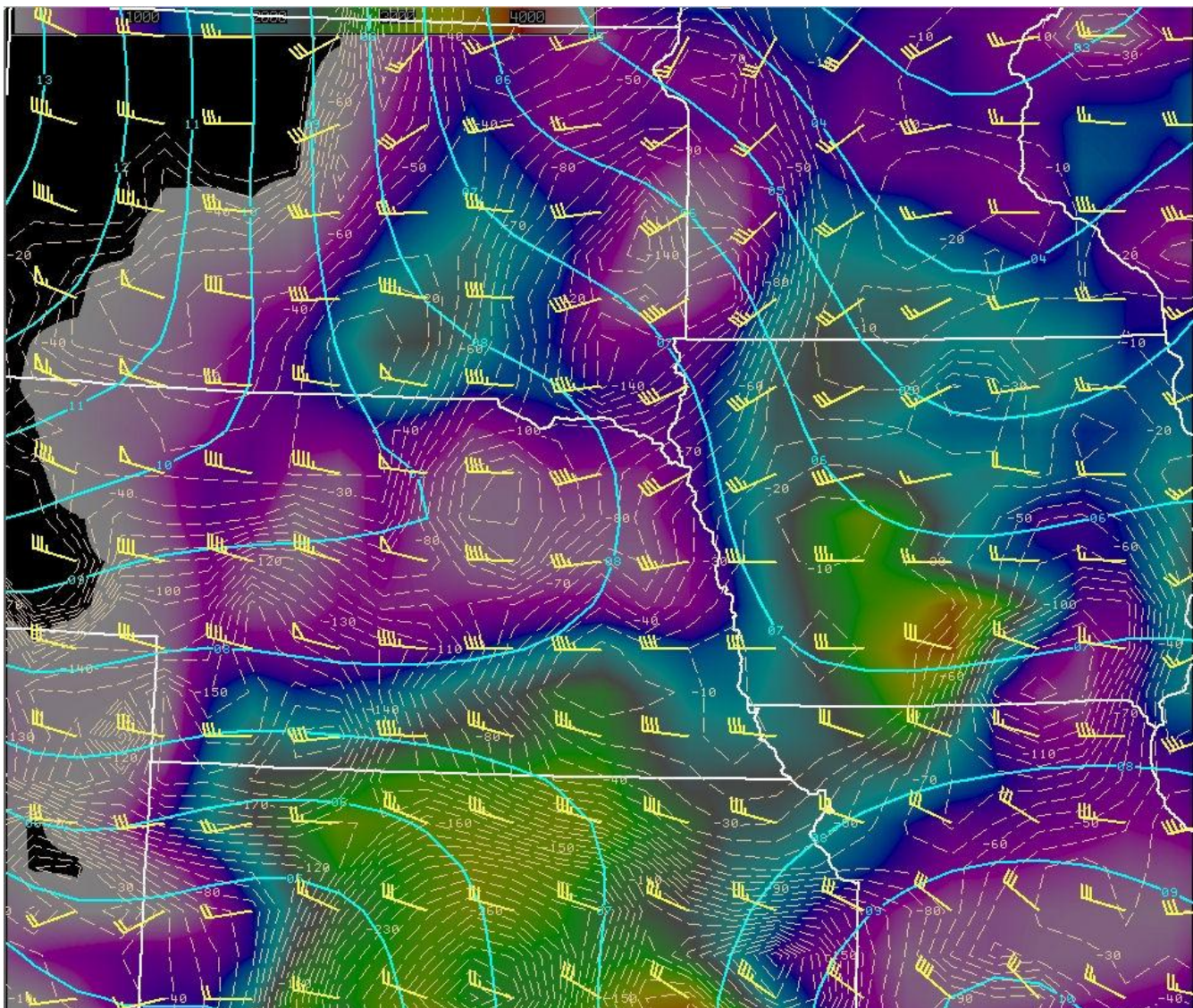
```

PRECIP WATER= 1.51 in
K-INDEX= 38
TOTALS INDEX= 50
SWEAT INDEX= 237
DRY MICROBURST POT=2: GST < 30 kts
FREEZING LEVEL= 14175 ft ASL
WET-BULB ZERO HGT= 12193 ft ASL
0-6 KM AVG WIND= 268°/24 kts
0-6 KM STM MTN (30R75)= 298°/18 kts
0-3 KM STM REL HELICITY= 32 m²/s²
FORECAST MAX TEMP=NA
TRIGGER TEMP= 27°C/81°F
SOARING INDEX=NA
MDPI/WINDEX = 0.49/41

-PARCEL- T=SFC;Td=SFC
INIT PARCEL P= 967 82 63 ° mb
INIT PARCEL T/Td= 82/63° F/28/17° C
CONVECTIVE TEMP= 84°F
LIFTED INDEX= -4.7
CCL= 5864 ft ASL/ 819 mb
LCL= 5618 ft ASL/ 826 mb
LFC= 6151 ft ASL/ 811 mb
MAX HAILSIZE= 99.0 cm/39.0 in
MAX VERTICAL VELOCITY= 145 m/s
EQUIL LEVEL= 39287 ft ASL/207 mb
APPROX CLOUD TP=NA
POSITIVE ENERGY ABV LFC= 1566 J/KG
NEGATIVE ENERGY BLW LFC= -2 J/KG
BULK RICHARDSON NUMBER= 34.2
    
```

# Convective Environment

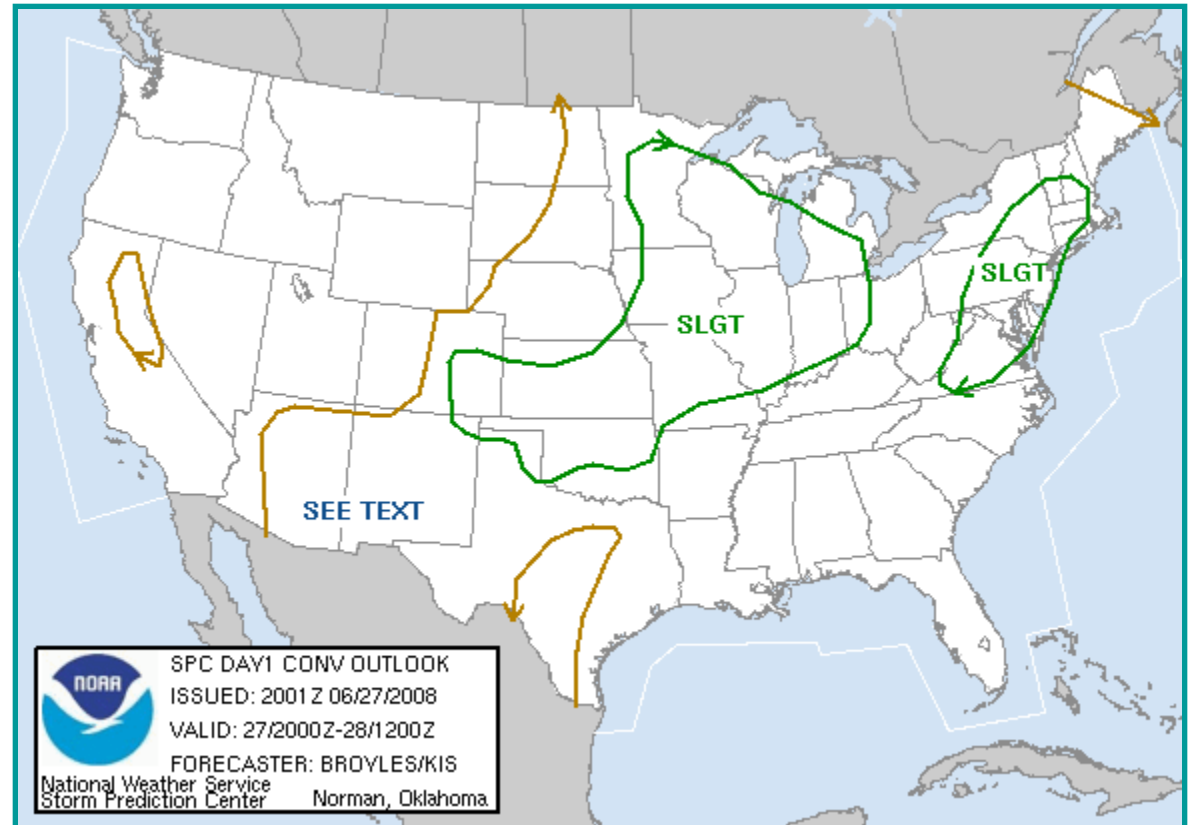
- RUC40 2000 UTC  
27 June
- SBCAPE around  
1500-2000 J/kg in  
eastern NE with little  
CIN
- Deep-layer bulk  
shear around 35+ kt
- Main synoptic front  
(pressure trough)  
southeast of Omaha  
metro



**Surface-based CAPE (shaded), CIN (dashed), MSLP (blue contour), 0-6 km bulk shear (barbs)**

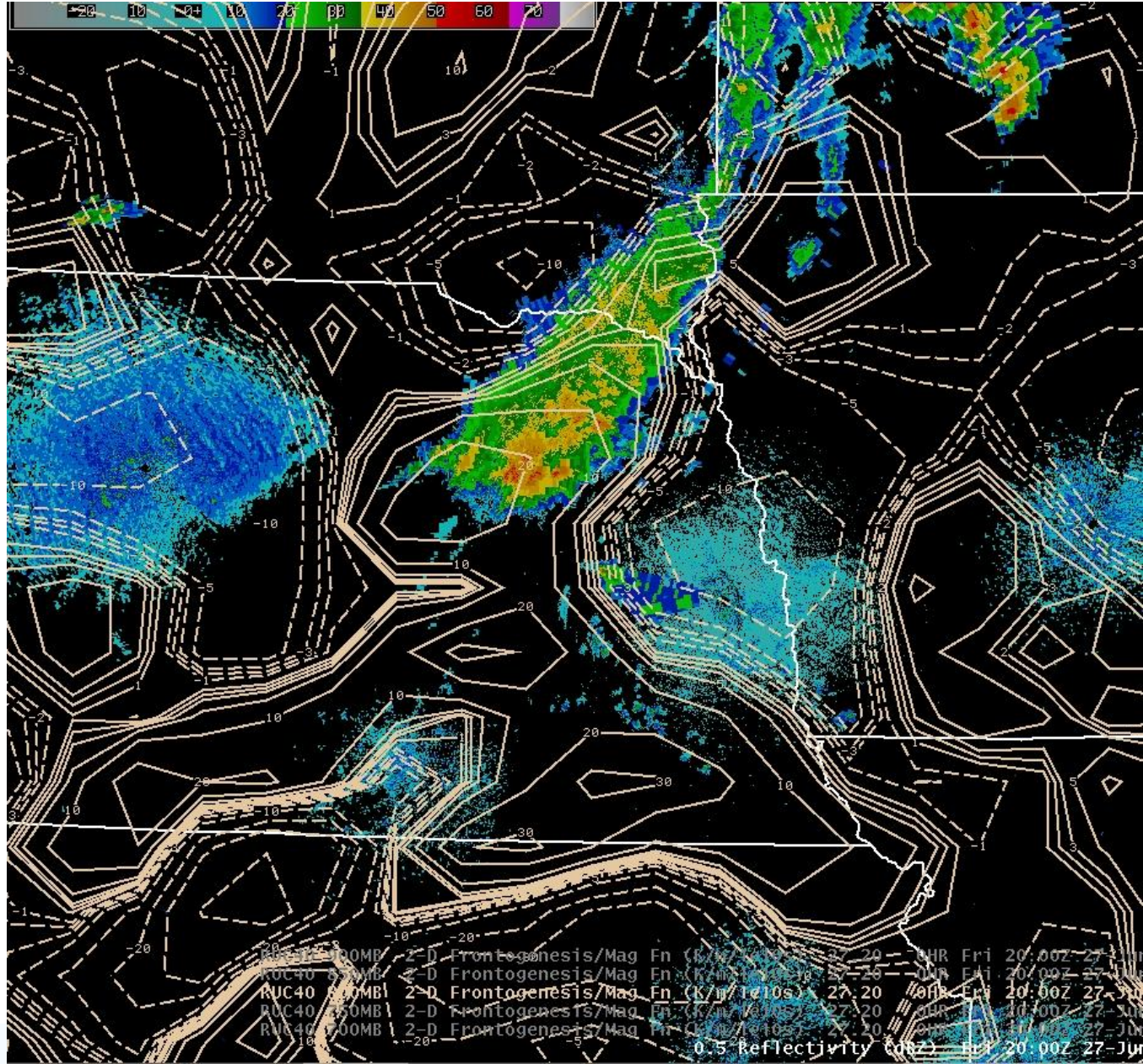
# SPC SWODY1 Outlook: 2000 UTC 27 June

- Earlier SWODY1 outlooks and OAX HWO/forecast similar
- Omaha metro not included in SWODY1 outlooks (was mentioned in HWO as northwestern extent of risk area)

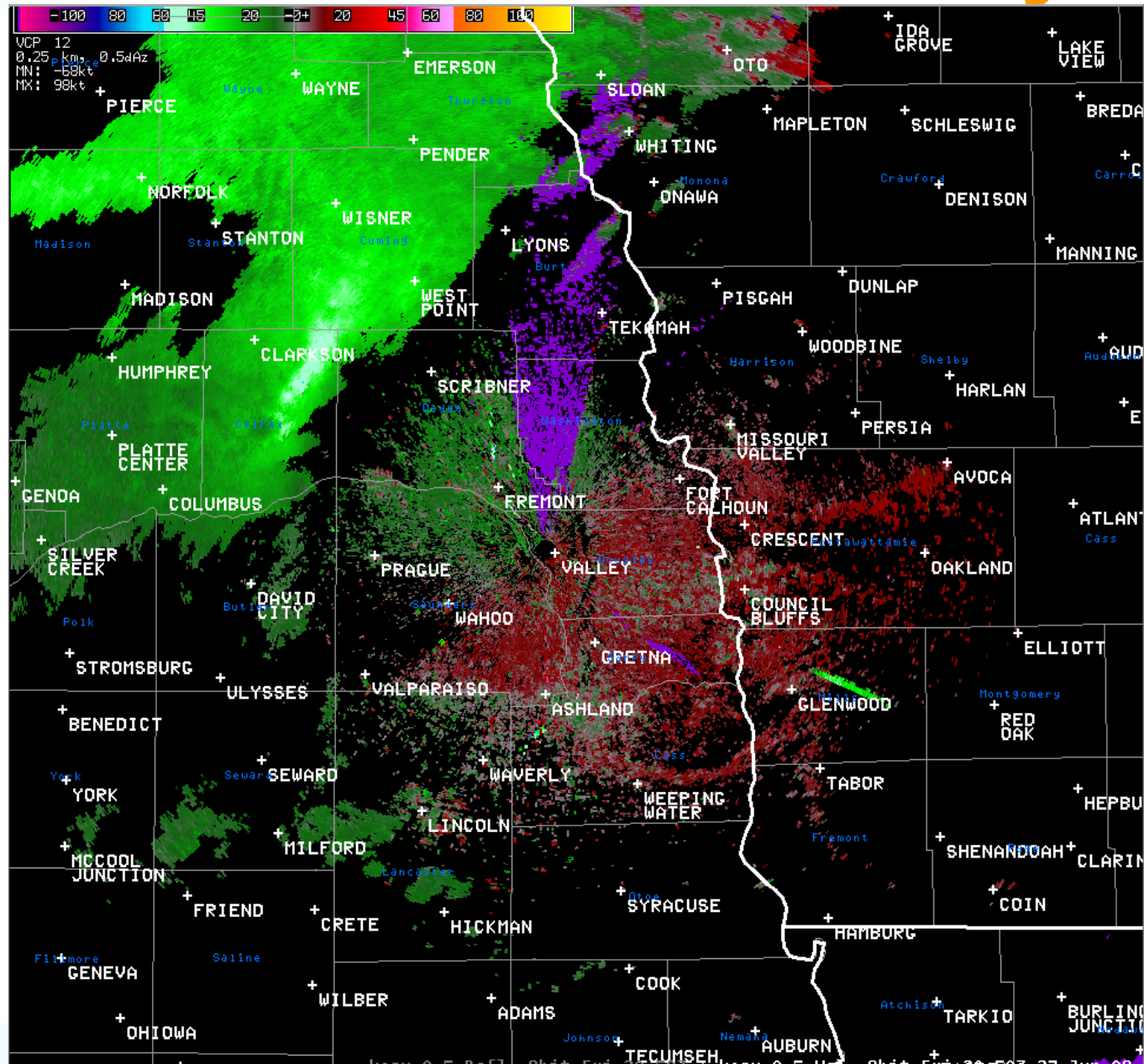


# Convective Initiation

- RUC40 2000 UTC 27 June 800 mb frontogenesis
- Radar mosaic 2000 UTC 27 June
- Initial storms post-frontal and elevated



# KOAX Radar Velocity

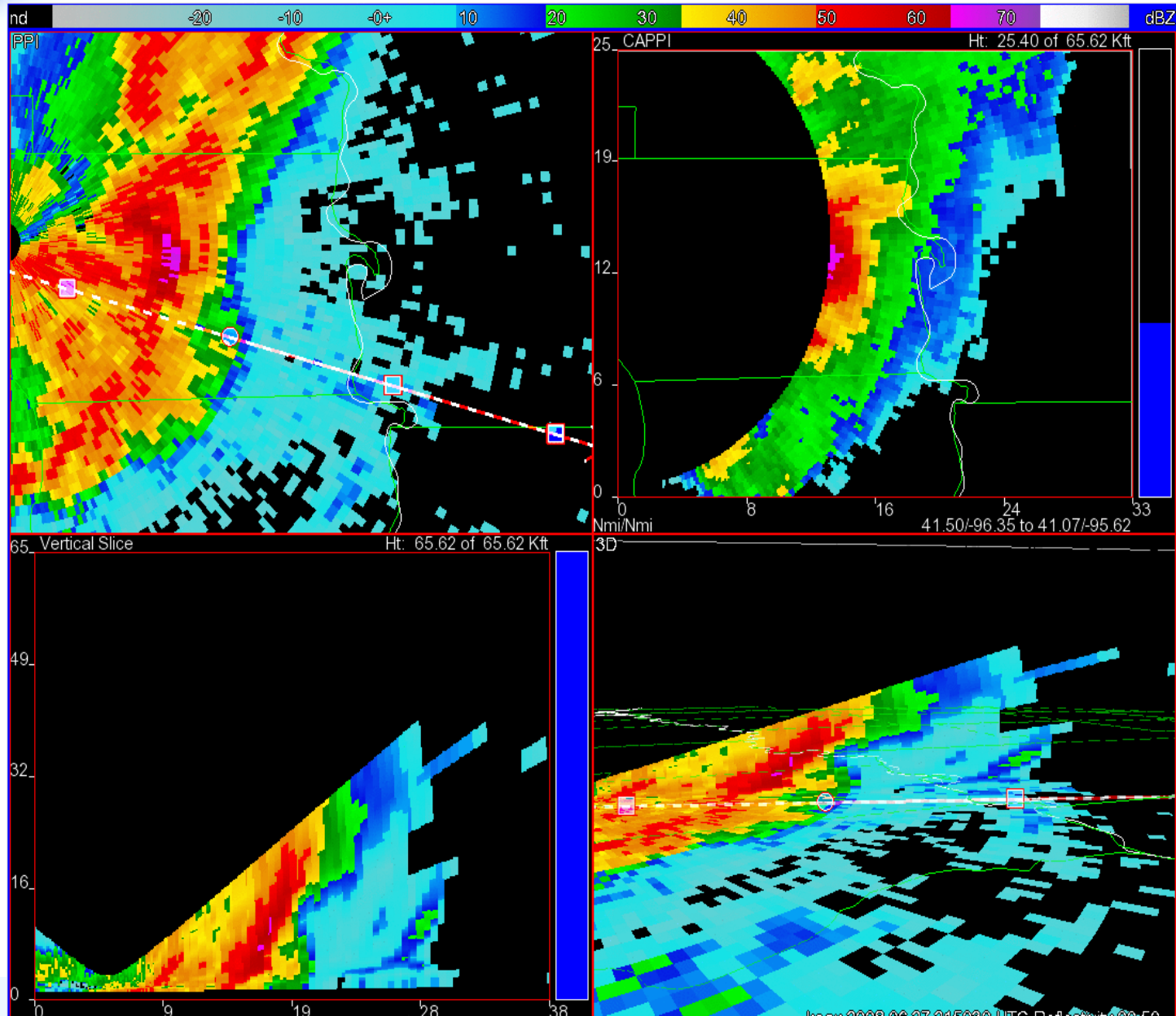


- Velocity loop for event
- Note:
  - Downburst (divergent) signatures
  - VERY strong winds near ground (over 100 kt at 200-300 ft AGL)



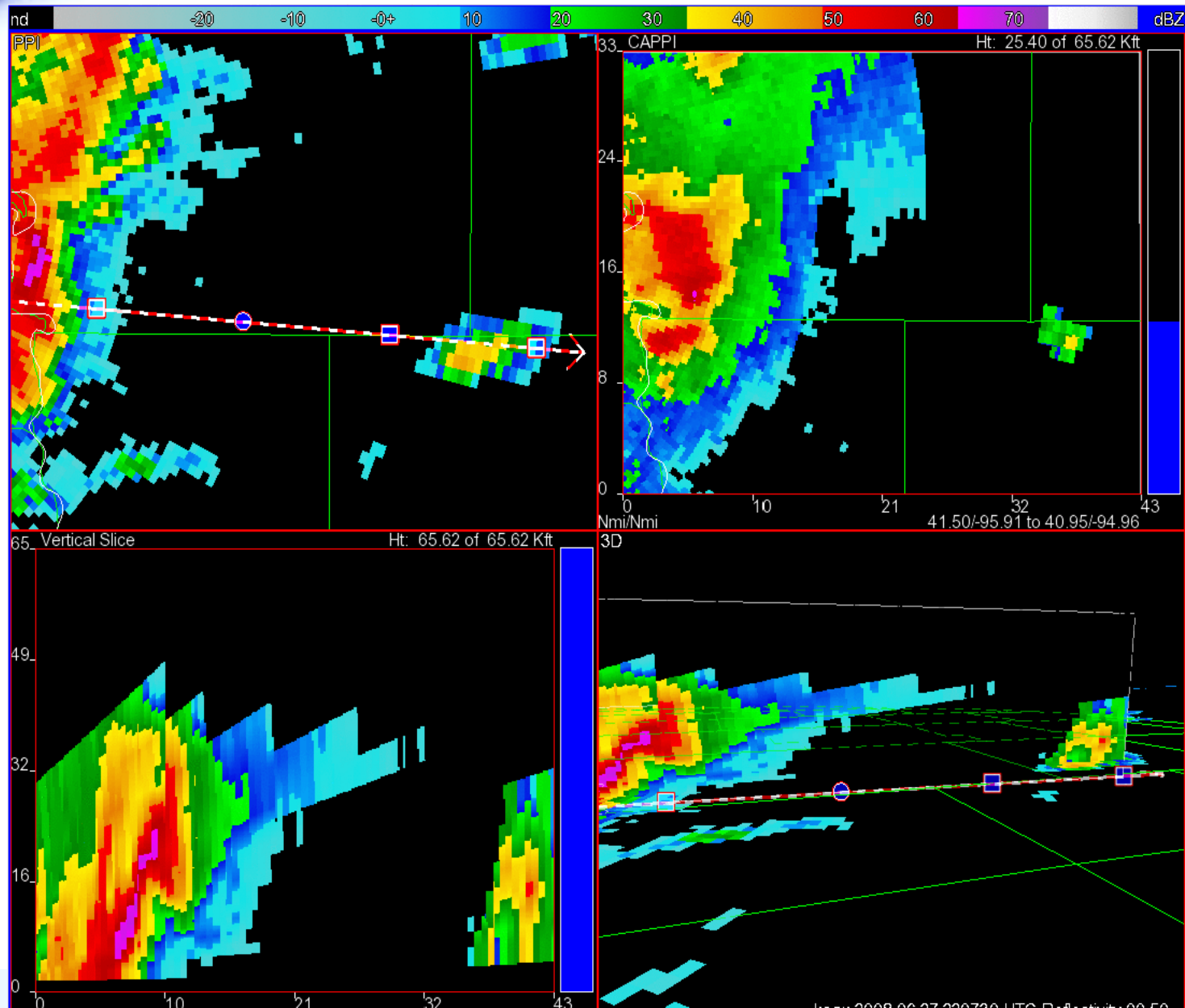
# KOAX Radar Reflectivity

- KOAX FSI
- Loop in eastern Douglas county, NE, and western Pottawattamie county, IA (Omaha metro)
- Note
  - Pulsing and dropping cores
  - Bowing and arcing segments



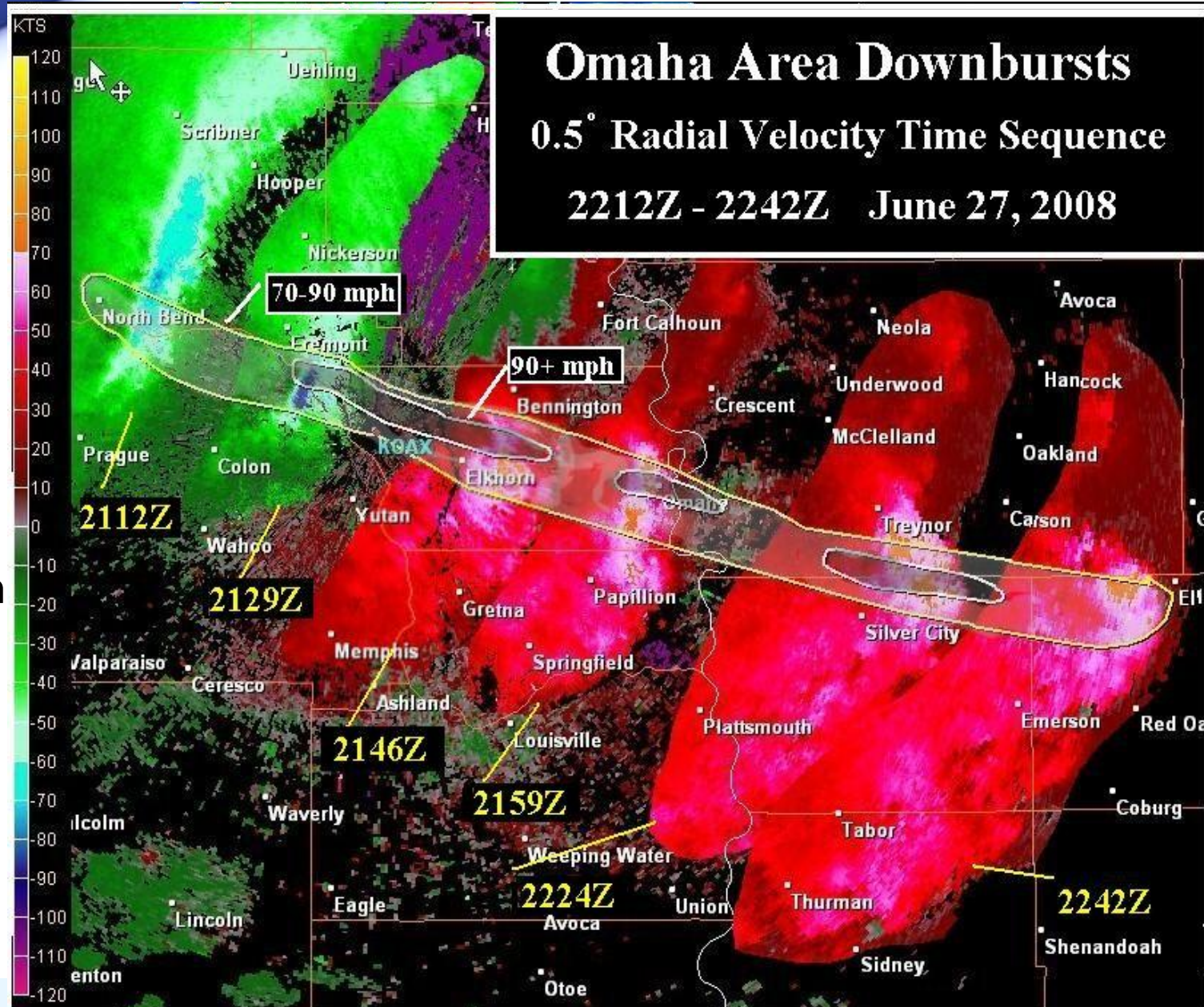
# KOAX Radar Reflectivity

- KOAX FSI
- Loop in Pottawattamie/ Mills/ Montgomery counties, IA
- Note
  - Pulsing and dropping cores
  - Bowing and arcing segments



# KOAX Radar

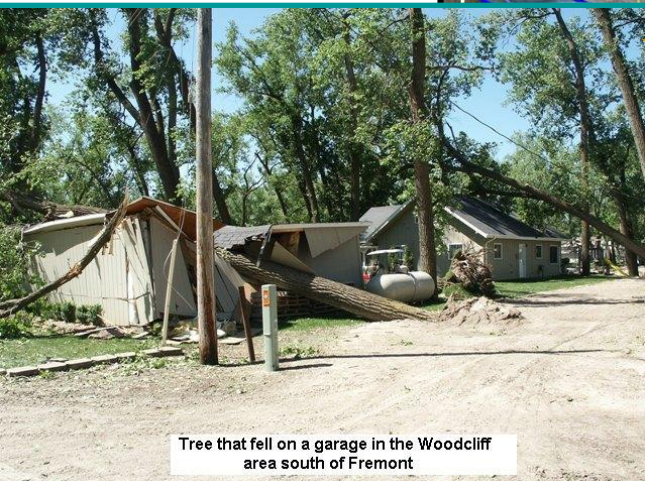
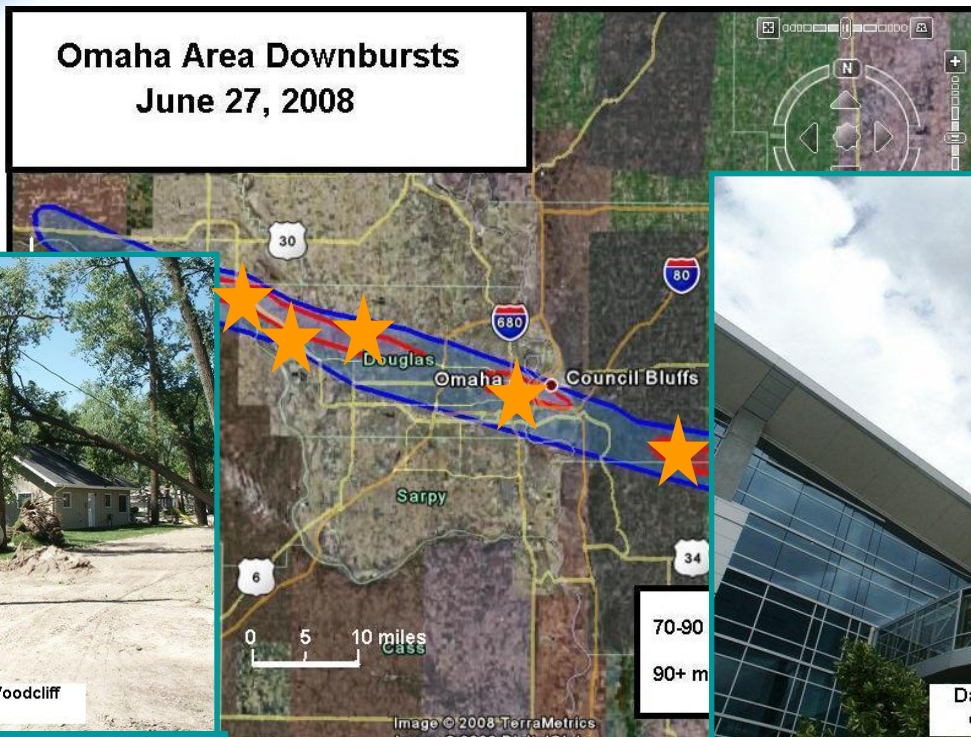
## Omaha Area Downbursts 0.5° Radial Velocity Time Sequence 2212Z - 2242Z June 27, 2008



- Reflectivity and velocity composite images (via GRlevel2 Analyst)
- Wind swath overlaid (from damage survey)

# Damage Survey

Omaha Area Downbursts  
June 27, 2008



Tree that fell on a garage in the Woodcliff area south of Fremont



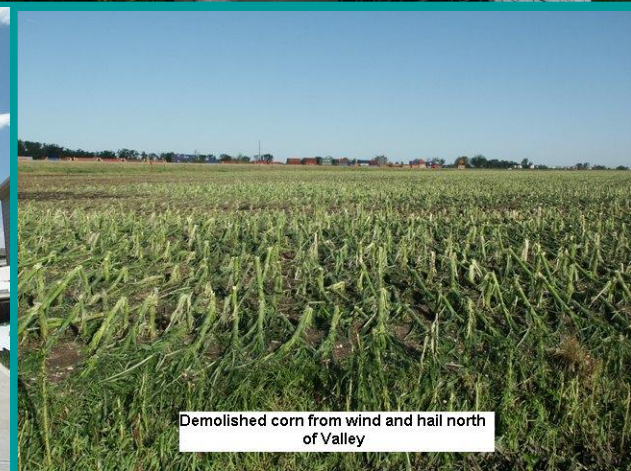
Damage to the northwest exterior of the Qwest Center in Omaha



Smashed in grain bin at the Valley COOP



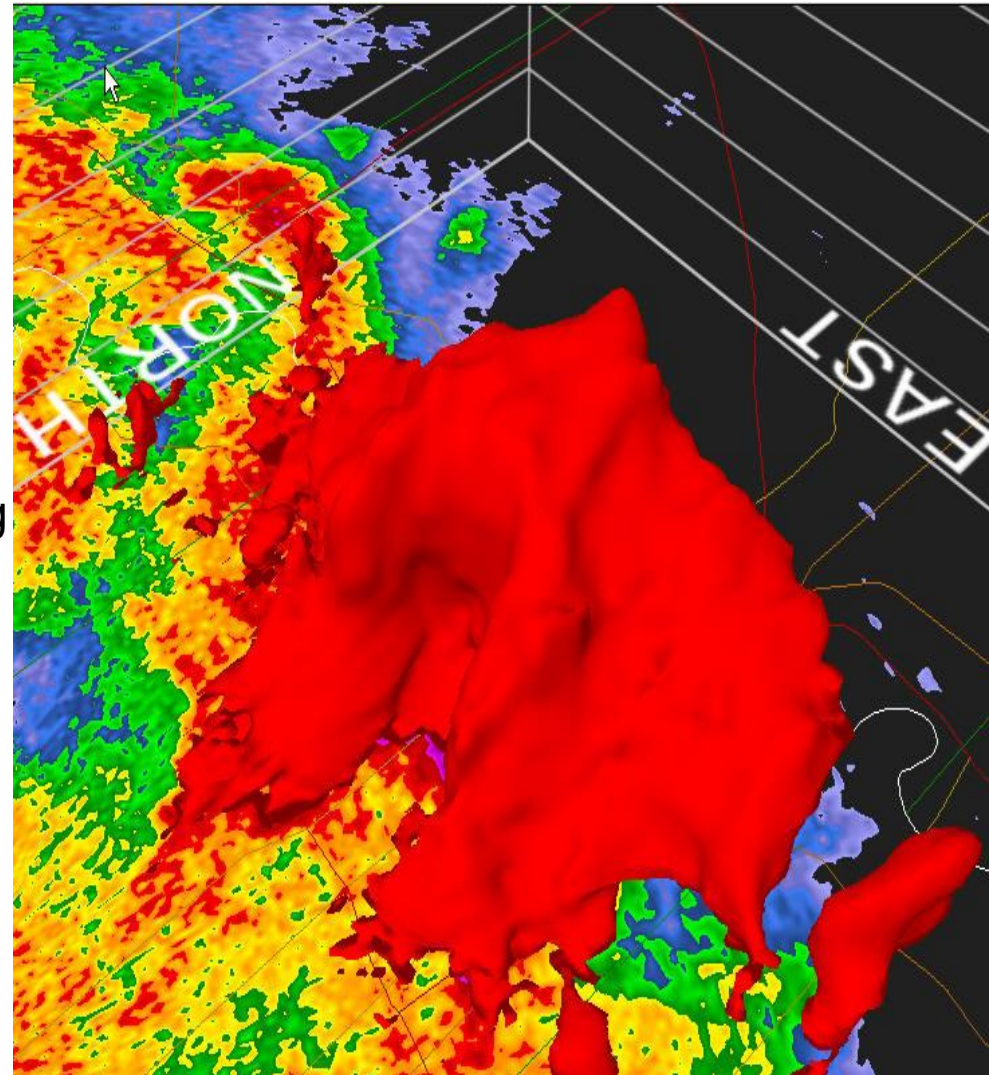
Damage to a home due to winds over 100 mph around 174th St. north of Maple



Demolished corn from wind and hail north of Valley

# Summary

- Convective, non-tornadic wind event
  - ☑ Initial forcing: Mid-level (800-750 mb) frontogenesis
  - ☑ Became surface-based in more supportive environment
  - ☑ Large hail and excessive damaging wind reports
- High impact on Omaha metro area
  - ☑ One of a series of severe thunderstorms
  - ☑ Significant and widespread structural and tree damage
- Future work
  - Identify other favorable environmental parameters
  - Compare to other events (i.e. Pakwash 1991, Concordia 1992)



**3-D KOAX Reflectivity at 2159 UTC  
(courtesy GR Level 2 Analyst)**



# This Case is Under Further Review!

Questions? Contact:

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[Brian.E.Smith@noaa.gov](mailto:Brian.E.Smith@noaa.gov)